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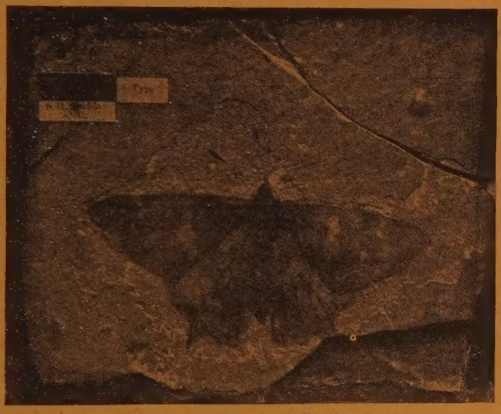

Prodryas persephone Scudder.

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PSYCHE

VOL. XXIV OCTOBER, 1917 No. 5

FIVE NEW SPECIES OF NORTH AMERICAN TACHINIDÆ.

By Harrison E. Smith,

U. S. Bureau of Entomology, West Springfield, Mass.

Following are the descriptions of five new species of Tachinidæ from North America. The writer wishes to acknowledge his indebtedness to Dr. C. H. T. Townsend, who has very kindly compared the following described species with material in the collection of the U. S. National Museum, and assisted the writer in many other ways with this difficult family of insects.

Pilatea unicolor sp. nov.

Length 6–8 mm. Black, brassy gray pollinose.

Front in male about three-fifths, in female about one and one-fourth to one and one-half times as wide as either eye. Frontal vitta opaque black, not as wide as either side of front. Diameter of head at vibrissæ less than at base of antennæ. Vibrissæ on the oral margin, facial ridges bristly on the lowest fourth to one-third. Proboscis short and fleshy, palpi normal, yellow. Ocellar bristles strong, proclinate; two pairs of orbital bristles present in the female, absent in male. Frontals arranged in a single row, descending to base of third antennal joint, outside of these a few bristly hairs. Parafacials and sides of front uniformly brassy gray pollinose. Antennæ black, nearly as long as face, the third joint in male three to three and one-half times as long as, in female about three times as long as the second. Arista thickened on the basal third, the penultimate joint as broad as long. Sides of face about one-sixth as wide as the facial depression, cheek width approximately one-seventh the eye height.

Thorax as viewed from the rear, marked with five black vittæ. Dorso-centrals three, sternopleurals three. Scutellum bearing a

discal pair, three pairs of long marginals and a weak pair of cruciate apical macrochaetæ. Legs black, front pulvilli in male about as long as the last tarsal joint. Middle tibiæ each bearing a single strong bristle on the outer front side near the middle, hind tibiæ pectinate with a row of bristles of unequal length.

Abdomen bearing discal and marginal macrochaetæ. Apical cell open, ending in costa a little before the extreme wing tip. Hind cross-vein nearer to bend of the fourth longitudinal than to the small cross-vein, the third longitudinal vein bearing two or three bristly hairs at its base. Wings except lower margins, usually wholly smoky tinged, or sub-hyaline. Tegulæ usually yellowish white, with a blending smoky tinge in males.

Described from three males and seven females. One taken by the author at Melrose, Mass., the remainder taken by Mr. C. W. Johnson at Glen House, N. H., Orr's Island, Me., Chester and Auburndale, Mass., and Middletown, Conn.

Holotype (male) and allotype (female) in collection of the Boston Society of Natural History.

Pilatea ruficornis sp. nov.

Differs from the preceding species, as follows: Length 12 mm. Black, gray pollinose species.

Parafrontals and sides of face rich golden yellow pollinose. Frontal vitta opaque velvety brown, at middle wider than either side of front. Antennæ except apical portion of the third joint yellow, arista thickened on the basal third. Facial ridges bristly on the lowest fifth. Dorso-central four, sternopleurals three. Middle tibiæ each bearing two strong macrochaetæ on the outer front side near the middle. Wings sub-hyaline, veins brown, the third longitudinal vein bearing two bristles at its base. Tegulæ milky white, bordered with yellow around the edges.

Described from a female specimen taken by Mr. S. A. Shaw, at Hampton, N. H., July 25, 1903. Holotype placed in the collection of the Boston Society of Natural History.

The two species above described are evidently congeneric with Coquillett's *Masicera celer*[1] recently designated the genotype of Pilatea Towns.[2]

[1]Rev. N. Amer. Tach., 1897, p. 114.
[2]Ent. News., Vol. xxvii, p. 178.

Spathimeigenia nigriventris sp. nov.

Length 7 mm. Black, grayish pollinose species.

Female: Front as wide as either eye, frontal vitta opaque dark velvety brown, parafrontals and sides of face gray pollinose. Frontal bristles in a single row, descending to base of third antennal joint, outside of these two pairs of orbital bristles. Eyes bare, ocellar bristles strong proclinate, weak bristly hairs on parafacials not regularly disposed. Antennæ black, the third joint three times as long as the second, arista thickened on the basal two-fifths, the penultimate joint as broad as long. Vibrissæ on an approximate level with the front edge of the oral margin, the facial ridges bristly on about the lower half. Cheeks about one-seventh the eye height, proboscis short and fleshy, palpi normal, yellow.

Thorax, pleuræ and coxæ black, grayish pollinose. As viewed from behind, the outer thoracic vittæ, anterior to the transverse suture, are approximately five times as wide as the two inner vittæ. Dorso-centrals three, sternopleurals three, the lowest of which is considerably weaker. Abdomen shining black, segments two to four gray pollinose on about the basal three-fifths, bearing marginal macrochætæ only. Venter distinctly carinate and bearing rather long bristly spines, a piercing ovipositor present. Scutellum bearing a short discal pair, three pairs of long marginals and a short weak pair of apical macrochætæ. Legs black, the middle tibiæ, each having a single stout macrochæta on the outer front side near the middle. Hind tibiæ pectinate with a row of bristles of irregular length.

Wings sub-hyaline, apical cell open, ending a little before the extreme wing tip. Third longitudinal vein bearing two bristles at its base, and a single bristle at inter-section of the small cross-vein. Tegulæ whitish, faintly bordered with yellow.

Described from a female specimen labelled Hatch Exp. Station, September 1, 1897. Holotype in collection of Mass. Agri. College.

Homœonychia rapæ sp. nov.

Length 7 mm. Head slightly wider than thorax, diameter of head at vibrissæ approximately as great as at base of antennæ. Eyes hairy, front one and one-third times as wide as either eye. Frontal vitta opaque velvety brown, slightly wider than either side of front. Ocellar bristles stout, proclinate; orbital bristles absent in male. Frontal bristles arranged in a single row, descend-

ing at least half-way down the sides of face, outside the frontal row to eye margin many scattered bristly hairs. Antennæ black, five-sixths as long as face, the second joint very short, the third joint broad, oval, nearly two times as wide as long. Arista thickened on the basal three-fifths, the penultimate joint as broad as long. Vibrissæ placed on about a level with the front edge of the oral margin, facial ridges bristly on the lowest two-fifths to one-half. Facial plate enlarged, three times as wide at its greatest width, as at base of antennæ. Probiscis short and fleshy, palpi normal, black. Cheeks about two-fifths the eye height.

Thorax black, gray pollinose, marked with four narrow vittæ. Scutellum bearing a discal pair, three pairs of long marginals and a cruciate apical pair of macrochætæ. Middle tibiæ bearing two stout macrochætæ on the outer front side near the middle. Hind tibiæ sub-ciliate. Abdomen gray pollinose with a median black vitta, bearing discal and marginal macrochætæ. Sides of first three segments faintly reddish black, abdominal hairs sub-erect.

Wings hyaline, veins brown, apical cell open, ending in costa a little before wing tip. Posterior cross-vein sinuate, nearer to bend of fourth longitudinal vein than to the small cross-vein. Third longitudinal vein bearing two bristles at its base. Tegulæ opaque milky white.

Described from a male specimen reared by Mr. R. T. Webber at the Gypsy Moth Parasite Laboratory, bred from *Pontia rapæ* Linn., August 17, 1915.

Holotype, Cat. No. 21024. U. S. N. M.

Allophorocera montana sp. nov.

Length 10–12 mm. Front in male about one and two-thirds, in female about two and one-fifth times as wide as either eye. Viewed from the side, the head projects in front of the eye about the horizontal diameter of the eye, frontal vitta opaque black. Frontal bristles disposed in a single row, descending a little below the arista, from the base of antennæ running obliquely to the eye margin. Sides of front bearing many bristly hairs, densely silvery gray pollinose, concolorous with parafacials. Ocellar bristles proclinate, two pairs of orbitals present in the female, absent in male. Antennæ black, the third joint in male about three and one-half times as long as in female about two and one-half times

as long as the second. Arista thickened on approximately the basal half, the penultimate joint as broad as long. Eyes bare, cheeks nearly one-third as wide as the eye height. Facial ridges bristly on the lowest three to four-fifths, vibrissæ strong, cruciate, on a level with the front edge of the oral margin. Proboscis short and fleshy, palpi black.

Thorax thinly gray pollinose, rather indistinctly vittate. Dorsocentrals three, sternopleurals three. Legs black, front pulvilli in male as long as the last tarsal joint. Middle tibiæ bearing a row of four or five bristles on the outer front side. Hind tibiæ pectinate with a row of bristles of unequal length. Scutellum black, sometimes a reddish tinge at the tip, bearing a weak discal pair, three pairs of long marginals and a shorter cruciate apical pair of macrochætæ.

Abdominal segments grayish pollinose on the basal margins, the first and second segments, each bearing a pair of marginal macrochætæ, the third segment a discal pair and a marginal row, the fourth segment bearing numerous macrochætæ and bristly hairs on the apical three-fifths. Hairs of abdomen numerous, long and erect.

Wings hyaline, apical cell open, ending well before the wing tip. Posterior cross-vein nearer to bend of fourth longitudinal vein than to small cross-vein, the third longitudinal vein bearing four or five bristles at its base. Tegulæ milky white, narrowly bordered with yellow.

Described from one male and three females taken by Dr. R. R. Parker at Powderville, Montana, April 18–24, 1916. One female, Gallatin Co., Montana, April 26, 1902, taken by Mr. R. Benton.

Holotype (male) in collection of Montana State College.

Females of this species deposit an elongate oval, flattened white egg. Hence, if the species is referred to the proper genus, as I believe, Allophorocera Hendel[1] is certainly not congeneric with Lydella Desv.[2] *Lydella nigripes* Fall. the genotype of Lydella has a distinct ventral carina, piercing ovipositor and larviposits living larvæ within the host, thus it appears that Allophorocera is a valid genus and not synonymous with Lydella, as stated by Mr. Coquillett.[3]

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[1]Verh. zool.-bot. Ges. Wien, L1, 203, 1901.
[2]Essai Myod., 112, 1830.
[3]Type Sp. N. A. Genera, Proc. U. S. N. M., Vol. 37, 563, 1910.

NOTES ON THE HABITS OF THE SNOW-FLY (CHIONEA).

By Werner Marchand,

Department of Animal Pathology, The Rockefeller Institute for Medical Research, Princeton, New Jersey.

The interesting wingless Tipulid genus Chionea has often attracted the attention of entomologists because of its being one of the few insects which are found regularly at winter-time, being apparently quite at home on snow and at low temperatures. Also this genus is not without interest for the student of Parasitology, in so far as so many wingless species are found among the parasitic insects, the habits of which may be elucidated by a fuller knowledge of forms with similar characteristics.

The genus Chionea was described first by Dalman (1816), with the type-species *C. araneoides*, from Sweden. Later, the snow-flies have been reported from places in Scandinavia, Germany and Austria, Russia, Alsace, Switzerland and Italy; the early stages have been described by Brauer (1854), and have been found repeatedly since, being terrestrial in habit and occurring under decaying leaves in wooded regions. At first, these captures were all recorded under the heading of *Chionea araneoides* Dalm., but it appears that the true *C. araneoides*, together with a dark and thick-legged form, *C. crassipes* Boheman, occurs only in Scandinavia, Lapland and Finland, while the Chioneæ of Germany, Austria and part of Russia (with *araneoides*), belong to *C. lutescens* Lundstr., and those of the Swiss and Italian Alps to *C. alpina* Bezzi. The two last-mentioned species are nearly related to one another, more yellow in color, and differ from the Scandinavian forms chiefly by the antennæ which are composed of a smaller number of joints, and bear longer hairs than in the northern species. Also considerable differences have been found in the arrangement and formation of the hairs on the legs.

In America, the species *C. valga* Harris, discovered in 1835 and described in 1841, has been found repeatedly since in New England (Emerton), Minnesota (Lugger), and Canada (Gosse). Interesting notes on its habits, especially on its copulation, we owe to Lugger (1896), who observed the species in Minnesota. According to Johnson (Psyche, 1907, p. 41–44), it is doubtful whether there is

more than one species of Chionea in North America, though several have been described, but Bezzi (1913) thinks that *C. scita* Walker must be regarded as a good species.

During a sojourn in Davos, Ct. Grisons, Switzerland, at an altitude of ca. 1560 m. (4,680 feet) above sea-level, I found occasion to observe these insects, which were entirely new to me. As I find that the peculiar hibernal habits of this and some other winter-insects are not yet clearly understood, the publication of my results, however fragmentary, may be of some interest.

The first specimen, a male, was found on November 21, 1913, at Luginsland, Davos-Dorf, on a warm, sunny day, when the snow on which a crust had already formed, was softened and partly melted at the surface; and large numbers of flies of the families Tipulidæ (Trichocera), Simuliidæ, Chironomidæ (Diamesa, etc.), Mycetophilidæ, Borboridæ, Muscidæ, etc., were found alive or half-frozen on the snow, having evidently escaped from their hibernation quarters, and fallen on the snow after a brief flight in the warm afternoon sunshine. A few Trichoptera (belonging to *Psilopteryx zimmeri*, a late fall species) and spiders were also collected. It was only when I had returned home and assorted the captures, that among the spiders the Chionea was discovered and its systematic position among the Tipulids readily ascertained with the aid of Hueguenin's remarks on it. The specimen had, however, been killed together with the other material.

On November 24 at noon a new snow-fall set in, and a second specimen, a female, was found about 4 p. m. running over the fresh snow. This time, no other insects were seen on the snow. The locality of these captures was a comparatively dry, sunny slope of southeast exposure which in summer is covered with alpine meadows. There were no trees except a few groups of Larch-wood (larix), and low pines.

After it had been collected, this Chionea was carried about for several hours in a small glass bottle in my pocket. On my returning home, it was placed on a plate on which it started running about eagerly, attempting to climb up the margin. It was, however, invariably driven back when approached by the hand, which gave me the impression that it was the heat of the hand which caused it to change its course. A small piece of snow being placed on the plate, the Chionea at once climbed on it, pressing its pro-

boscis against it for a short while as if to drink, then running over it and going again on the plate. Attempting to escape, it was repeatedly driven back by the approaching hand. I noticed that my hands were rather warm. In fact, it did not stop when approached by my wife's hand which was cooler, and on which the insect would continue to run.

The specimen was kept alive and a cage constructed which permitted its observation. The cage consisted of a glass tray,

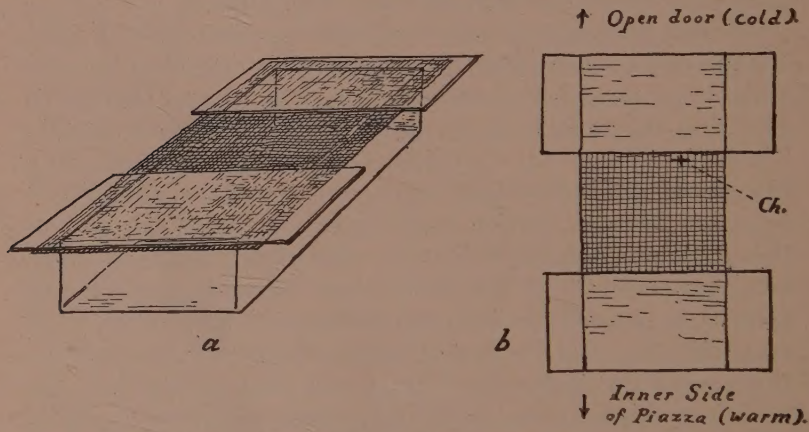

Fig. 1. Observation cage used in experiments with Chionea: a, general view of cage; b, same seen from above; #, habitual resting place of Chionea.

about one and one-half feet long, covered entirely with two glass covers, which could be replaced, wholly or in part, by wire-netting. After some experimenting, it was preferred to cover the whole with wire-netting, and in addition to this, to cover the short sides of the tray with the two pieces of glass, leaving an open space in the middle, covered only by wire-netting, as seen in the figures. The tray was, at first, half filled with sifted earth and half with snow in order to ascertain whether the insect would show a preference for one of these. It seemed equally at home on both and observations tended to show that Chionea is a true snow-insect, not a mere accidental one, as has been supposed by Emerton (see Johnson, PSYCHE, 1912, p. 102), and as all the other insects quoted above undoubtedly are.

The Chionea was placed on the border-line between snow and

earth. It went on the snow but soon passed over to the sifted earth without apparently showing any preference for either, the temperature being low; running for awhile over the earth on which, on account of its brownish color, it was hardly visible, it passed again on the snow and ran there approximately as long as it had on the earth. It then started, with some effort, to climb the glass walls of the cage, demonstrating the negative geotropism of most insects, and arrived on the wire-netting of the cover. In the arrangement described, it was found that the Chionea preferred the uncovered part of the wire-netting where the open air had access. Apparently it was seeking out the coldest spot available.

It was observed that each time when, in the course of running about on the wire-cover, it approached the part which was covered by a glass plate it stopped its straightforward course, running alongside the covered part and soon returned into the open region. Several times it went under the glass cover as if for trial, but never remained very long; while in the open region it would run about freely in various directions.

It was not ascertained with exactness how long the insect stayed in the covered nor how long in the open part, but the observations clearly show that the Chionea preferred the open region, which seemed to indicate that it found here its apparently very low optimum of temperature. The cage was exposed to the open air at not much above freezing temperature, in a glass veranda, the door of which was kept open.

It was found that this behavior of the Chionea was somewhat modified by the influence of light. On that side of cage which was in greater distance from the light, it went more often under the covering glass than on the side nearer to the light. It seemed therefore that the negative thermotropism was stronger and more pronounced in the light than in the shade.

At the same time the Chionea showed itself distinctly positive phototropic. The conflict between the two instincts must be strongest on the side nearer the light, as here one should expect the insect, on account of its phototropism, to go under the glass cover. However, it is in the light, that it most consistently avoids going under the shelter. As a result, its favorite place remained that part of the open region which was nearest the light and just bordering the glass cover, and it was here that the fly usually came to rest.

The cage was now turned 180°, all other conditions remaining unchanged. The Chionea at once demonstrated its positive phototropism by running in a straight line towards the light. Arrived at the glass-covered part, however, it turned aside without going under it. After a little while, it was seen to go under this glass cover for a short time, but soon came back and returned across the whole uncovered field, coming to rest at the edge of the other glass cover, which was now on the darker side of the cage. Left to itself, the Chionea would sometimes tumble down from the wire-netting of the cover, and run about for awhile on the snow or earth. However, it always soon climbed the glass wall again, and took to its former place in the open part of the cover, which, exposed to the draft, was probably colder than the snow.

To test out whether Chionea really preferred the open region because of its being colder, I warmed my hand by means of a hot electric light bulb, and could, by coming near it with the heated surface of the hand, drive the insect from the open field of the cover into the space under the glass cover. I concluded that the Chionea, as a rule, seeks out the coldest place it can possibly find. The experiment was then closed.

On November 25, in the morning, the Chionea was found sitting at the under surface of the glass cover which was covered with hoar-frost. The snow in the cage was partly melted, and the resulting humidity had formed an ice-crust on the glass cover. The Chionea seemed perfectly at ease while resting on this icy surface.

Towards noon I brought the insect out into the open air to the edge of the balcony, on which fresh snow had fallen. It was watched but otherwise left entirely to itself, and was seen running over the snow alongside the whole railing of the balcony, the direction being against the wind (positive anemotrop?). It kept itself somewhat on the inner side of the railing on the side of the house, but pursued its course in a nearly straight line. Only once it turned to the outer side and had to be driven back to prevent its falling from the balcony. Three times it went to the left (the side of the house-wall), going below the edge and to the underside of the snow-layer covering the railing, remaining quiet for a short time, but each time returned soon to the surface of the snow and continued its walk. Though on these three occasions it came near to

the place where the snow-covering bordered on the wood of the railing, the insect was never seen going on the wood, showing a well-marked preference for the snow. Arrived at the end of the balcony, the Chionea had to be stopped in order to prevent it from falling; this was done by approaching it with the finger, avoiding actual contact. This was found sufficient to cause it to change its course. If carefully touched with the tip of the finger, it contracted all the legs towards the body and remained quiet. After making two attempts to go in the previous direction, it finally turned to the side, and continued to run in a straight line alongside the transverse railing of the balcony in the same way as described before.

The fly was then placed in its cage, where it at once started climbing the glass walls. Shortly afterwards, at 1 p. m., it was again found sitting on the underside of the cover, this time under the glass plate. At 2.30 p. m., however, it was found to have resumed its favorite resting-place, under the wire-cover in its open part, at the edge of the anterior glass cover, that is, at the coldest spot.

On November 26, a very sunny day, observation was omitted in the morning. At 2.30 p. m. it was found that the snow in the cage was melted and the Chionea was lying motionless in the melting water, apparently dead. However, as I knew from my experience that drowned caterpillars may often be revived, an attempt was made to bring the Chionea back to life and was successful. The insect gradually began to move its legs and antennæ, until, at 4.30 p. m., it had regained its normal condition. It was then placed back in the cage.

During the efforts to revive the insect, it was kept in the heated room at least part of the time, in order to facilitate the evaporation of the water. A piece of blotting-paper was used first to absorb the excessive moisture. Blowing seemed to aid it in resuming its movements. When these had been started, however feebly, a piece of snow was brought to touch the claws of the feet, and it was noticed that each time the leg responded with a considerable reaction. In fact, snow touching the feet proved to be the strongest stimulus to cause them to move, and I conclude therefore that normally the contact of the tarsal claws with the surface of the snow is the necessary stimulus for Chionea to keep moving continually, as to remain on one place might cause it to freeze.

In the evening the temperature had sunk to −8° C. and the Chionea, kept in the veranda at a temperature considerably below freezing, was sitting on the earth. On November 26, it was still alive sitting on the earth on that side of the cage directed towards the outer, colder side of the veranda. For several days, as the writer was ill, no observations were made. The Chionea was kept alive in the hope that some day a male specimen could be found which would make it possible eventually to obtain copulation and eggs. The weather was moderately cold and the cage remained in the glass veranda.

On November 29, after it had been raining all night, a very warm but cloudy day followed. The snow everywhere was sinking together. The Chionea remained quiet for the whole day hiding in a corner. In the evening, when the temperature had sunk again below freezing (−2½° C.), the door of the veranda was kept open and the Chionea was seen creeping slowly about on the earth of the cage.

On December 2 (melting weather), snow was placed in the cage, the Chionea being active most of the time. At 1 p. m., the temperature had arisen to 6° C., and the Chionea was very lively, running about in its cage. On December 4, a violent "Foehn"—storm set in, and, unfortunately, no trace of the Chionea could be found, the strong wind having blown the cover partly from the cage, which permitted the insect to escape. It had lived ten days in captivity, apparently without taking any food other than snow-water.

My disappointment over the loss of my interesting object of observation was great, and it was with mixed feelings when on December 7, after an abundant snow-fall, I found two male Chionea, at about 11 a. m., on the snow, somewhat below the spot where the two previous specimens had been found. These males were both larger than the first one found on November 22, and very lively. In spite of a careful search, no females were found and the hope of bringing about a copulation had to be abandoned. The two males perished within the next few days and no further specimens could be obtained.

On December 8, the first of the males died in consequence of exposure to sunlight. As the fresh snow-fall was followed by bright, sunny weather, the temperature in the glass veranda and in the

glass cage had apparently become too high; however this may be, the insect was found dead in the cage in the direct sunlight. The other specimen had remained in the shade. In the evening, the temperature fell to $-11°$ C., and being curious to know whether the Chionea would withstand such low temperatures, I left the glass door of the veranda open over night. On the morning of December 9, the second Chionea was dead, apparently killed by frost, after the fashion of the famous tamed herring which had learned to walk about and breathe air but one day fell into a pond and was drowned. The adaptation to cold has evidently its limits even in Chionea, and this insect, although it has its most active stage at low temperatures, seems to withstand freezing less than many other insects which at low temperatures become entirely passive.

The possibility that the males have normally a shorter life than the females should, however, be taken into consideration, and may partly account for their rapid death. The factor of humidity may also be of importance, and death in the bright sunlight may be due to increased evaporation as well as to the temperature.

Conclusions.

Chionea is not an accidental guest on the snow but perfectly adapted to life on the snow by its habits. This is evident from the fact that it can move about on snow for a practically indefinite time without being frozen, while most other insects which may be collected on the snow have been carried there by air currents or attracted by the strong light, but do not run about on the snow and usually perish within a few hours on the spot where they have fallen. Furthermore, the Chionea regularly drinks water from the snow by pressing its proboscis against it as was repeatedly observed.

Chionea is attracted to the snow:

(1) By the bright light and white color of the snow (+phototropism);

(2) By a thermotropic reaction which is, in itself, stronger than the phototropic reaction and which increases in the light(−thermotropism);

(3) By the peculiar contact of the snow and a direct stimulus resulting from the action of cold on the claws (special temperature-sensibility?).

I have made an attempt, on the basis of these meagre data, to gain an idea of the ecology of Chionea in Nature. What is the biological significance of its living on the snow? Food is apparently not taken, hence the quest of food cannot be the purpose. The larval stage can naturally not live on the snow. Consequently, I assume that the ecological significance of the nivicole adaptation is that it affords to these wingless insects an opportunity for the sexes to meet, the considerable distances which may be covered on the snow supplanting in a measure the function of the wings, especially if the insects are aided by the eyes in finding each other. As long as the insects are hidden in the half-frozen ground under the snow, the chances of the sexes to find one another are very remote. However, as soon as fresh snow falls, and the temperature rises (usually for one or two days) to somewhat above freezing, Chionea becomes strongly positive phototropic and negative geotropic. The insects seek the light, climbing up, probably not through the snow, but around tree-trunks, bushes or other places relatively free from snow, and run about, covering considerable distances. After copulation has taken place, the males die, and the females return under the snow where they are protected from extreme cold, depositing the eggs from which larvæ may develop in the spring. Possibly, the change to low temperature, as it usually occurs soon after each fresh snow-fall, will be in itself a sufficient cause for the insects, males and females, to return under the snow until the next favorable opportunity. On all of these points new observations are necessary. I wish, however, to call attention to the fact that Lugger in Minnesota (1895) has indeed observed that Chionea copulates on the snow, in spite of several degrees below freezing in the cases observed by him, and I found my own hypothesis confirmed by his findings. Lugger also observed that the female crawls down through a crevice in the snow and deposits her eggs which are described as elongated and yellowish, but which did not hatch.

It is to be noted in this connection that, according to T. W. Cockle (1914), also Boreus, the other well-known snow-insect, is found to copulate in mid-winter on the snow, as he observed in many instances giving a detailed account of the process; and it would be of considerable interest to know whether in Boreus there

is any special adaptation by tropism to the life on the snow, as apparently the case in Chionea.

The species treated here was probably Bezzi's *Chionea alpina* described by him in 1908, a few years before these observations were made. I conclude this from a comparison of my specimens with Bezzi's description, finding the characters to agree pretty closely. Characteristic for *Chionea alpina* are: the color, being yellowish but darker than in lutescens, the thickened femora, the stiff bristle-like hairs on the legs, showing a distinctly serial arrangement, the seven-jointed antennæ (eight in valga, nine to ten in araneoides) and the hairs on these which are, in lutescens, much longer than in the northern species. Moreover, the type-locality of Bezzi's species, Chiareggio, Valtellina December 8, 1899), is not very far from my locality, and separated from it only by the Engadine valley. On the other hand, Bezzi records another specimen of *Chionea alpina*, which he received from the Silvretta-glacier, likewise in the Rhætic Alps and not far from the Davos-valley. The size of my specimens ranges from 2–4 (♀ 5?) mm. in length.

As far as I know, *C. alpina* has not yet been figured, and the accompanying imperfect drawings may facilitate comparison with other species. Bezzi states that in the female of *Chionea alpina* the ovipositor is always curved upwards, a feature which, however, was absent in the specimen from Silvretta-glacier. My specimen did not show anything of this sort. Possibly, the ovipositor assumes this position after copulation has taken place or after oviposition. Another characteristic which presents some difficulty is the number of antennal joints. I believed my specimens to be six-jointed, but Bezzi gives seven joints as the number in his species, the last two joints being discernible, as Lundstroem has pointed out, by the position of the bristles. I have made some drawings of the antennæ, as accurately as possible, on which it is seen that they may be called seven-jointed, the last two joints being however fused into one.

Note.— One of the two male specimens still in my possession was found to have lost all its legs during transportation, showing also in this peculiarity its relationship to the Tipulids. I notice that all the legs have broken off at the trochanter, the latter remaining attached to the coxa. It seems, therefore, that there is a predisposed

place of rupture, by autotomy, at the border-line between femur and trochanter.

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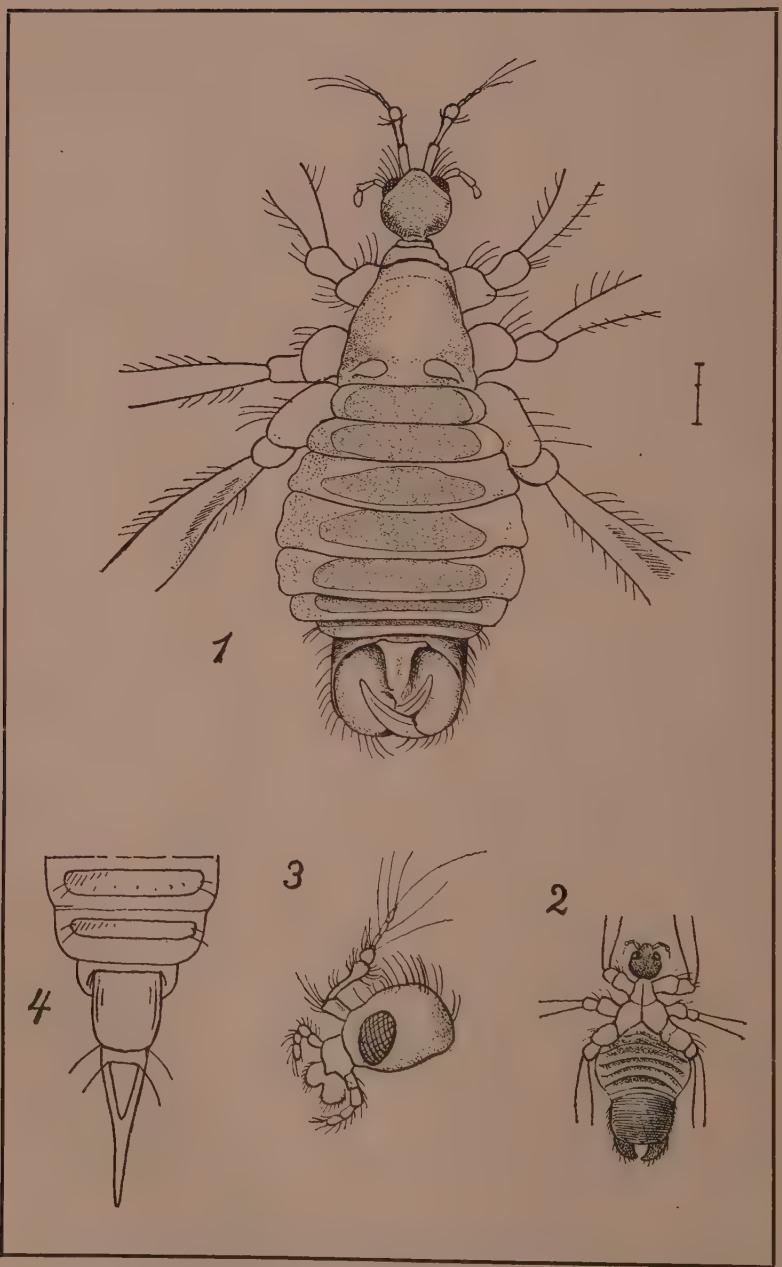
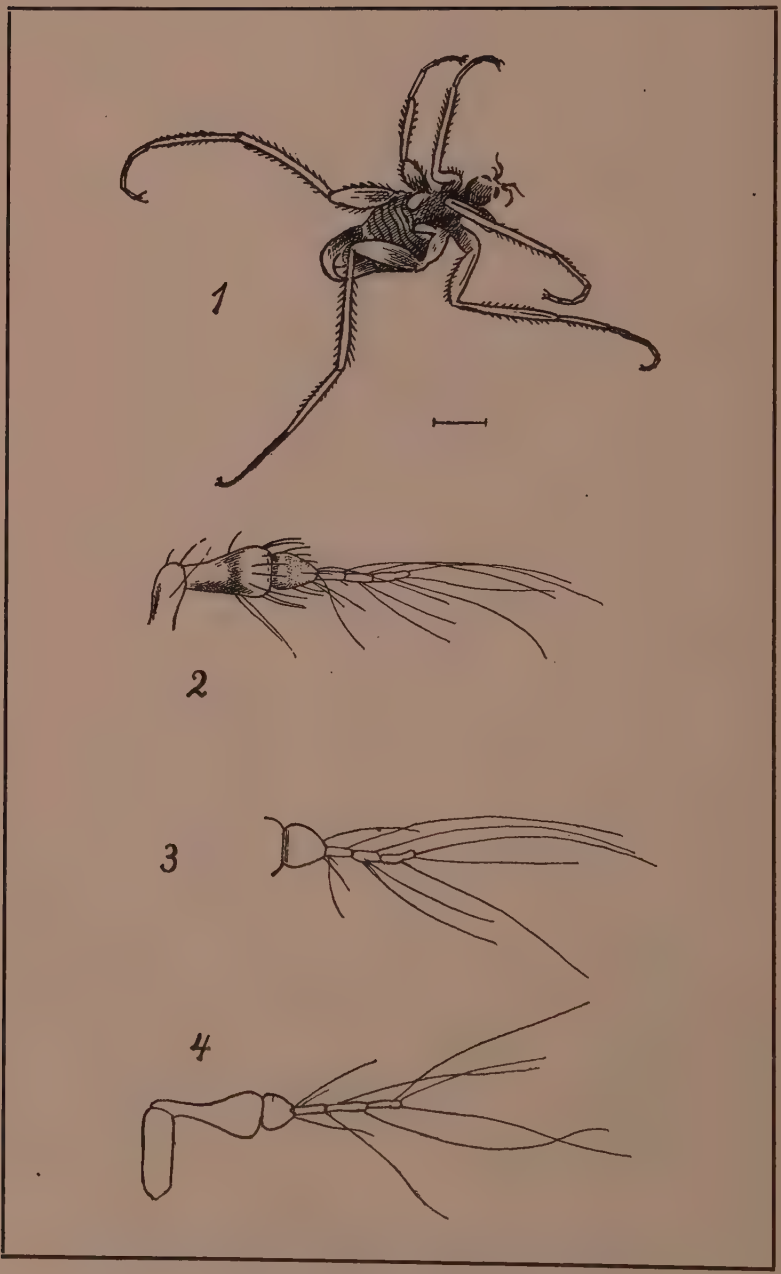
[1] Only the more important papers are listed here. Many publications contain data on Chionea, its local occurrence, etc.



MARCHAND—*Habits of the Snow-fly.*



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Explanation of Figures.

Plate VIII.

Fig. 1. *Chionea alpina* Bezzi, male, dorsal view.
Fig. 2. Ventral side of another individual, male.
Fig. 3. Head of male, lateral view.
Fig. 4. Ovipositor of female, dorsal view.

Plate IX.

Fig. 1. *Chionea alpina*, male, habitus. (Freshly killed individual.)
Fig. 2. Antenna of male.
Fig. 3. Terminal portion of same antenna, slightly turned aside.
Fig. 4. Antenna of another individual.

A NEW SPECIES OF CRIORHINA FROM NEW ENGLAND.

By Charles W. Johnson,

Boston, Massachusetts.

Criorhina intermedia sp. nov.

♂. Face covered with white tomentum; facial tubercle, a line above the oral margin (narrowly separated from the tubercle) and the cheeks, shining black, frontal triangle with yellowish tomentum, antennal process, the narrow front and vertex black, occiput grayish pruinose, pile yellowish, antennæ black, base of the third joint brownish, arista black. Thorax black, in front of the transverse suture grayish pruinose, behind shining black, the long pile in front of the suture, on the pleura, post-alar callosities and scutellum, yellow, the remaining pile black, forming a broad band between the wings. Abdomen; the first and second segment grayish pruinose, with long yellowish pile, the remaining segments

shining black, with black pile. Legs black, tips of the tibiæ and all of the tarsi reddish brown, the upper side of the hind metatarsi black, front and middle femora fringed below with long yellow hairs, posterior tibia strongly curved, under side of the hind tarsi with yellow tomentum. Halteres light brown. Wings hyaline, all the veins margined with brown, most prominent on the cross-vein, stigma yellow, squamæ brown, fringed with brownish hairs. Length, 16 mm.

The female has the front about one-fifth the width of the head, dusted with brown and with brownish hairs, face yellowish pollinose with a wide facial stripe.

One male and six females collected by the writer at Jaffrey, N. H., June 15 and 18, 1917, on the flowers of the choke cherry. One female, Dartmouth, Mass., April 25, 1916 (N. S. Easton). Holotype, allotype and four paratypes in the collection of the Boston Society of Natural History. One paratype in the Museum of Comparative Zoölogy and one in the author's collection. In one of the specimens from Jaffrey and the one from Dartmouth, Mass., the band of black hairs on the thorax is absent, while in some of the others it is less prominent than in the holotype. The series vary in size from 12–16 mm.

The species is readily separated from *C. verbosa* Walker, in having the tibiæ black and in the absence of yellow pile on the abdomen beyond the second segment. The Jaffrey specimens would indicate that it appears later in the season than *C. verbosa*. My records for the appearance of the latter range from March 13 to April 20. It seems to be more closely related to *C. nigriventris* Walton, from which it is separated by the yellow pile on the abdomen.

NOTES ON TINGIDÆ.

By Herbert Osborn and Carl J. Drake.

In recent numbers of Psyche,[1] Mr. H. M. Parshley has presented articles on Tingidæ in which he has called attention to what he considers errors in articles written by the writers and offered numerous criticisms that it seems necessary to note. In so far as these criticisms and corrections are warranted they are of course to be welcomed, but there are many instances in which a careful reëxamination of material studied and a study of material coming to hand since our papers were published fail to establish the validity of Mr. Parshley's criticisms. Some of these are considered in the following notes and others are discussed in a paper in the *Ohio Journal of Science*. (Vol. XVII, pp. 295–307.)

Fenestrella ovata Osborn & Drake (Plate VIII, Fig. *d*).

The criticism by Parshley of the drawing of this species in his second paper is quite inaccurate as a comparison of the photograph (Fig. *d*) of the type with the drawing will indicate. The statement, "the base of the third antennal segment is slightly capitate," is entirely absurd as there is no such structure present, and, furthermore, capitate refers to a structure at the distal end of a segment. We have recently received a second specimen of this unique little form from Ohio.

Key to the Nearctic Species of Physatocheila.

1—Rostrum short, reaching between the intermediate coxæ
P. brevirostris Osb. & Drk.

Rostrum considerably longer and of various lengths 2

2—Rather large insects (length 4.6 mm.), second antennal segment small at the base and much enlarged at the apex.
P. major n. sp.

Smaller insects (length 4 mm. or less), second antennal segment not as the above 3

3—Rostrum not extending beyond the apex of the rostral sulcus; outer costate nervure that bounds discoidal area nearly straight; color dull, uniform yellowish-brown.
P. parshleyi n. n. (= *plexa* Parsh.)

[1] December, 1916; February, 1917.

Rostrum reaching more or less beyond the rostral sulcus; outer costate nervure that bounds discoidal area sinuate; color either brownish, or brownish more or less tinged with yellow, or brown or grayish-brown variegated with pale cinereous and black, or cinereous.

P. plexa Say (= *P. variegata* Parsh.)

Physatocheila parshleyi nom. nov. (= *P. plexa* Parsh.).

This species was described by Parshley in his first paper as the true form of *P. plexa* Say. Although the species meets the requirement of the writer's contracted form of Say's description and his assumed characters of a true *plexa* it is distinctly at variance with the original description if taken in its entirety. Compare as follows: (Say) "Body brownish, more or less tinged with yellow" surely cannot be the same as (Parshley) "Uniform dull yellowish brown"; (Say) "two series of which on the lateral margins are a little larger," in reference to the reticulations of the elytra is hardly identical with (Parshley) "Costal area of the hemielytra with two almost regular series of areoles"; the rostrum is not mentioned in the original description of *plexa* and the length of the rostrum is entirely an assumed character by Parshley. It might be well to note that the length of the rostrum is not given by Say in any Tingid description, also that this species has never been taken in the regions where Say did his entomological work. In as far as we know this species has only been taken in the New England States and eastern Canada; *plexa* is a common species in the states where Say worked and our collections include numerous specimens of this species from Portland, Oregon, to the Atlantic Ocean. The structures mentioned in the key will readily separate this species from allied forms and the other characters can be noted in Parshley's first paper under *plexa* Say.

Physatocheila plexa Say, Uhler, Heidemann, Osborn & Drake (=*variegata* Parshley, but not *plexa*).

The conclusions drawn by Parshley in his first paper are based on a special interpretation of Say's description and a few assumed characters as indicated below.

PARSHLEY.

". . . brownish, more or less tinged with yellow," and ". . . two series [of reticulations] . . . on the lateral margins . . . [of the hemielytra] . . . ."

SAY.

"Body brownish, more or less tinged with yellow, with dilated approximate punctures; head with three elevated lines: thorax not dilated on the sides; with three elevated lines: scutel also with three elevated lines: hemielytra with small, symmetrical, orbicular reticulations of nervures; two series of which on the lateral margins are a little larger; those near the inner margin of the membrane also a little larger."

The color description of *plexa* is rather indefinite as only the color of the body is mentioned by Say and this is not of a constant and uniform color as distinctly indicated by the words, "*more or less tinged with yellow.*" By omitting "*of which*" Parshley gives a different meaning to the portion of the description which describes the lateral margins of the elytra, and, furthermore, in the form that the author calls *variegata* (= *plexa* Say) the costal area is not always either triseriate or averaging three rows of areolæ as stated in the description. Evidently, the writer failed to study all his paratypes as Fig. 1, *b* will indicate; this is a photo-

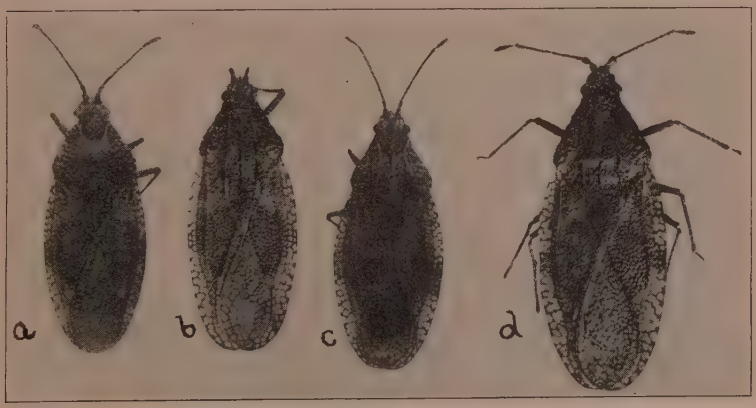

Fig. 1. *a, b,* and *c, Physatocheila plexa* Say (= *variegata* Parsh.); *d,* P. major. n. s. p. (Photographs by Carl J. Drake.)

graph of the paratype from Wellesley, Mass., which was sent to the junior author by Parshley as a typical form of *variegata*. As stated under *parshleyi*, Say never mentioned the length of the rostrum in any Tingid, and the length there given is only an assumed character.

Our collections include specimens from Oregon (Portland), Idaho, Nebraska, Kansas, Iowa, Wisconsin, Illinois, Michigan, Virginia, New York, and Massachusetts. Stål also records the species from "Illinois." This series of specimens indicate the species to be quite variable, especially in color, length of rostrum, and in number of rows of areolæ in costal area, but there seems to be no distinct variety. The many variations in color may be noted in the key. Our Illinois specimens are almost of a uniform brownish color and the costal area is quite uniformly biseriate. The costal area of the elytra is either uniformly biseriate, or triseriate, or more or less irregularly triseriate, or with various intermediate forms between bi- and triseriate. The length of the rostrum is quite variable, always extending beyond the end of the rostral sulcus, but never reaching beyond the posterior margin of the second abdominal segment. In taking the length of the rostrum one should always note the position of the head and prothorax. In the senior author's collections are specimens determined by Uhler and Heidemann. The specimen determined by Heidemann is listed by Parshley as a paratype under *variegata* from Berkeley Springs, Va.

Physatocheila major sp. nov.

Head armed with five spines, the spines arranged as in *plexa* Say. Antenniferous tubercules large, curved inwardly. Antennæ clothed with fine short hairs; basal segment swollen, a little longer than the second; second segment short, small at the base and strongly swollen at the tip; third segment longest, slenderest, about two and a half times the length of the fourth; fourth segment fusiform. Pronotum tricarinate, the carinæ low and uniseriate; lateral margins as in related species; hood a little larger than in other Nearctic species. Rostral sulcus broad, the rostrum almost reaching posterior margin of second abdominal segment. Elytra a little longer than the abdomen, broadly rounded at the apex; costal area rather broad, irregularly areolate, with two or three confused rows of areolæ; discoidal area a little broader and the

outer boundary slightly more sinuate than in *plexa*. Wings slightly longer than abdomen. Abdomen quite broad in both male and female. Length, 4.6 mm.; width, 1.8 mm.

Color.—General color brownish, slightly marked with yellowish and black. Antennæ brownish, the distal half of apical segment blackish.

Two specimens, a male and female from Urbana, Illinois. The photograph illustrates the type specimen; all specimens of *Physatocheila* are equally enlarged. This species is readily separated from allied forms by its larger size and the second segment of the antennæ.

Melanorhopola duryi Osborn & Drake (Plate VIII, Fig. *e*).

The form of this species is not very broad when compared with females of other species in the genus. The third antennal segment is slightly enlarged towards the apex and the distal segment is decidedly conical rather than fusiform as stated by Parshley in his second paper. The photograph of the type will illustrate the structures mentioned. All photographs of the species in this genus are of the same magnification and the antennæ have been placed in a horizontal position with the body so that the proportions between the same or different species are quite accurate.

Fig. 2. *Melanorhopola duryi* sp. nov., much enlarged. (Photo by Drake.)

Melanorhopola clavata Stål (Plate VIII, Figs. *a*, *b* and *c*).

This is a common and well-known species in the

eastern part of United States. Our most western records are Iowa and Nebraska. The photographs show the difference between the short winged and long winged forms, also the extreme variations in the lengths of the antennæ.

Melanorhopola uniformis Stål (Plate VIII, Fig. *f*).

This species, as we determined it, is quite closely allied to *lurida*. The photograph represents the South Dakota specimen listed in our Ohio bulletin.

Melanorhophola lurida Stål (Plate VIII, Figs. *h* and *g*).

Parshley has erroneously stated the length of the antennæ of this species in his second paper. The antennæ either slightly exceed, equal, or fall considerably short of the tip of the abdomen; the third segment is also more or less swollen near the apex. The lateral margins of the pronotum are either vertical or reflexed more or less against the surface of the pronotum. The form of *lurida* and *uniformis* is also very much confused and not based on specimens of the same sex. The male of *lurida* is narrow, but the female is as broad or broader than the female of *uniformis*. The male of *uniformis* is unknown to us. The Figures *f* (*uniformis*) and *g* (*lurida*) illustrate the short winged females of the two species; Figure *h* is the macropterous male of *lurida*. The two specimens of *lurida* show almost the extreme variations in the length of the

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Explanation of Plate.

Photographs by Carl J. Drake.

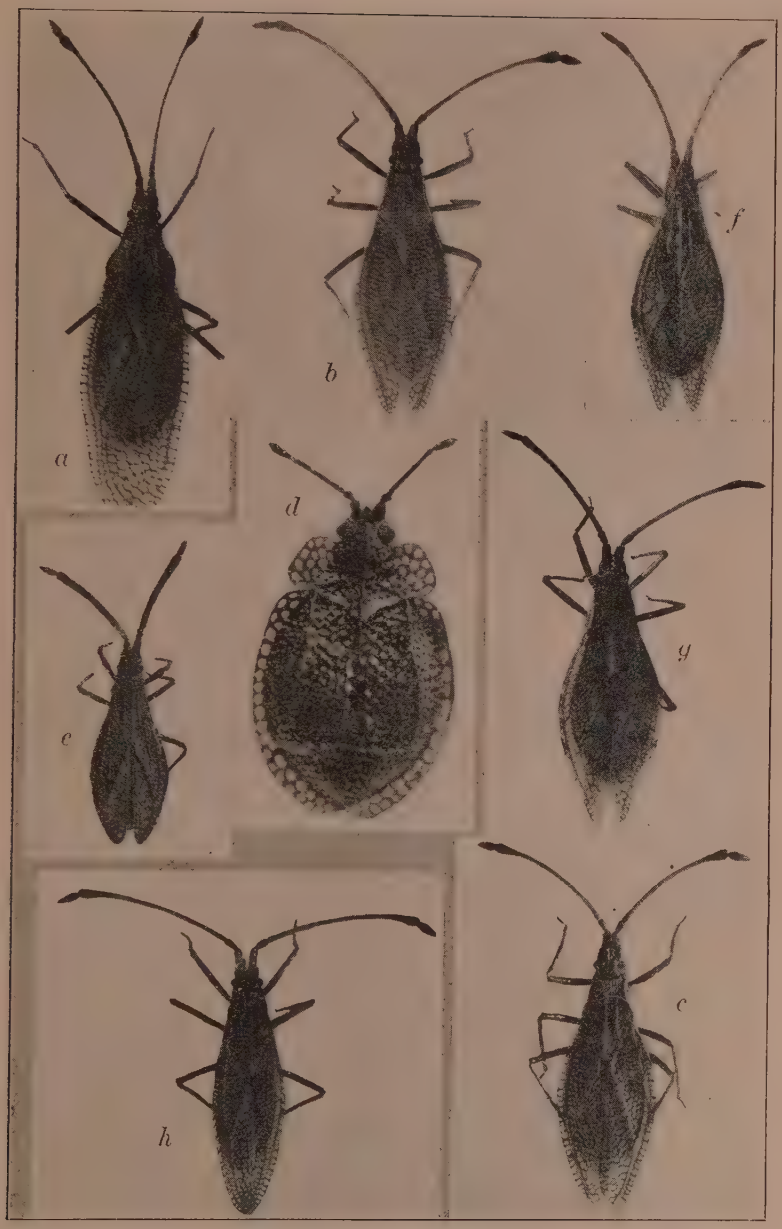
Figs. *a*, *b*, and *c*. *Melanorophola clavata* Stål (*a*, macropterous female; *b* and *c*, brachypterous females, the latter with short antennæ).

Fig. *d*. *Fenestrella ovata* Osborn and Drake (type greatly enlarged).

Fig. *e*. *Melanorophola duryi* Osborn and Drake (type).

Fig. *f*. *Melanorophola uniformis* Stål (brachypterous female).

Figs. *g* and *h*. *Melanorophola lurida* Stål (*g*, brachypterous female with short antennæ; *h*. macropterous male with long antennæ).



OSBORN AND DRAKE—*Tingidæ*.

antennæ in this species. The size of *lurida* in our series of twenty-four specimens varies in length from 4.35 mm. to 5.8 mm. It is impossible to separate the smaller specimens of *lurida* from *obscura* Parsh., by the inadequate and obscure description nor by the characters used in the key to the genus in his second paper. In both of these papers a great deal of emphasis is placed on size, narrow form, and antennal structures that apply equally well to the smaller specimens of *lurida*. Possibly an examination of the types may enable one to separate them.

BOOK REVIEWS.

THE MOSQUITOES OF NORTH AND CENTRAL AMERICA AND THE WEST INDIES. By L. O. Howard, H. G. Dyar and Frederick Knab.

Volume 1, pp. I–VI, 1–520, 1912.
Volume 2, pp. I–X, Plates 1–150, 1912.
Volume 3, pp. I–VI, 1–523, 1915.
Volume 4, pp. 525–1064, 1917.

A notable chapter in that branch of Dipterology known as Culicology has been completed by the appearance of Volume 4 of this magnificent contribution to the knowledge of American mosquitoes—a work which reflects high credit not only upon the authors and the institution which made publication possible, but also upon the recognition entomology has won and which really has made possible the completion of such a comprehensive and exhaustive study. It is a response to the recognition of the vital relation certain species of mosquitoes sustain to the welfare of the human race, and a demonstration of the fact that the knowledge of pathogenic forms is incomplete without a study of associated and allied species.

The older entomologists easily recall the earlier days when only a few supposedly uninteresting and assumedly similar or very similar species of mosquitoes were known to occur in America, and can compare the conditions then and those obtaining now with practically 400 recognized species referable to 25 genera, and presenting undreamed of biological and morphological diversities,—

and this after excluding the Corethrinæ. It is not in mere numbers of species that this work displays its merits. It is most emphatically a compend of our knowledge—taxonomical, synonymical, morphological, biological—of a large and important group presenting many difficult problems to the solution of which the several authors have contributed largely, and at the same time most carefully made due acknowledgment of the part played by their colleagues.

This series of volumes leaves little to be desired along historical, biological and economic lines, and since the first two volumes appeared in 1912, and were duly reviewed, there is no necessity of extended comment in this connection.

The first part of the taxonomic portion (Volume 3) appeared in 1915, and is continued in the just issued Volume 4. Obviously one could hardly be discussed intelligently without the other. The authors have recognized only those genera which could be defined by characters found in both sexes, and consequently submerged some because they were based upon peculiarities exhibited by one sex, giving as a reason therefor that not all specimens submitted for determination are bred, nor are both sexes always represented. This is very frequently the case with other insects. It is doubtless more convenient from certain standpoints, and yet it is admitted by the authors that genera erected upon characters found only in one sex are valid, and the disregard of such genera may not be generally accepted. A striking application of this method is seen in the inclusion of such different forms as *Aëdes fuscus* O. S., now considered a synonym of the European *A. cinereus* Meign., and the large series represented by the salt marsh mosquito (*sollicitans*), and a number of our common woodland mosquitoes in the same genus. There are marked differences in these insects not only in the male palpi, but in the genitalia, and the mere fact that there has been reduction in palpal structures in several independent series by no means invalidates the use of such modifications for generic separation. This is simply a tendency in specialization which is closely paralleled in the gall midges where we consistently find the same phenomenon, though in both sexes, in each of several large tribes and within certain limits the palpal reduction indicates the degree of specialization, and in the group

mentioned is usually accompanied by other modifications—not infrequently biological as well as structural.

The stability of modern nomenclature is rather rudely shaken by the footnote, on page 824, to the effect that those who had unlearned *Stegomyia fasciata* must now proceed to dissociate their mental processes from *Aëdes calopus* and think in terms of *Aëdes argenteus*, a discovery made too late for incorporation throughout a work which has been in progress for approximately ten years, and if later workers insist upon a strict application of the rules of nomenclature, it is probable that there will be another change in the name of the genus to which this world-famous mosquito is referred. The announcement that *Aëdes fuscus* O. S. is a synonym of the European *Aëdes cinereus* Meign. is also made in a footnote, and like the preceding was received too late for incorporation in the body of the work.

It is not expected that a dissertation of this character would be entirely acceptable to all. It deals with a large group. The classification has been worked out in recent years from several very diverse standpoints. The authors have endeavored to harmonize the evidence presented by adult and immature stages and it is more than probable that no two or three men would arrive at the same conclusion in regard to a number of debatable points. We have in these volumes tabulations for the separation of families, tribes, genera and species in both imago and larval stages and also a remarkably comprehensive and detailed study of the larvæ. A knowledge of these latter, their habits and characteristics, is of great importance in mosquito control work. This series of four volumes constitutes by far the most complete account we have of any similar group and marks distinct progress toward that comprehensiveness and thoroughness investigators so generally recognize as ideal. It is unfortunate that two of the authors who undertook the preparation of the systematic part of this work did not have an opportunity of personally studying the types in European collections.

There doubtless will be some changes in generic groupings and possibly some in tribal definition, though the latter appears to the reviewer as very satisfactory. We have at least a magnificent basis for future work, and he who desires to improve upon the system proposed may well estimate in advance the amount of

labor involved in the attempt to rearrange this vast complex with its varying, and in some instances apparently antagonistic lines of development in the adult and immature stages. The faunal region covered is broader than that which falls to most investigators and moreover there have been exceptional opportunities for special collecting in a number of representative areas.

E. P. Felt.

NOTE OF CORRECTION (HEMIPTERA).

Psyche, 1914, Vol. 21, List Hem.-Het. of Maine:

In this article are a number of errors of determination, etc., which are corrected in my New England list recently published in the Occasional Papers of the Boston Society of Natural History.

Psyche, 1915, Vol. 22, Synop. Families:

P. 90, line 3 from bottom: "rostrum 3-segmented" should read rostrum 4-segmented.

Ib., Synop. Pentatomidæ:

P. 172, line 20 from bottom: "17" should read 16; line 8 from bottom: "14" should read 15.

P. 173, line 20 from bottom: "16" should read

1. **Peribalus.** Delete the next three lines and substitute:

16. Juga much longer than tylus.....19. **Dendrocoris.**
Juga not much longer than tylus.....17

Ent. News, 1915, Vol. 26, Ext. Anat. A. rapidus, etc.:

P. 212, "embolim" should read **embolium.**

Psyche, 1917, Vol. 24, Notes on N. Am. Tingidæ:

P. 24, The holotype of *Hesperotingis fuscata* Parsh. is in de la Torre Bueno's collection, not in Barber's.

For other corrections see Psyche, 1915, Vol. 22, p. 220.

H. M. Parshley.

EXCHANGE COLUMN.

Notices not to exceed four lines in length concerning exchanges desired of specimens or entomological literature will be inserted free for subscribers, to be run as long as may be deemed advisable by the editors.

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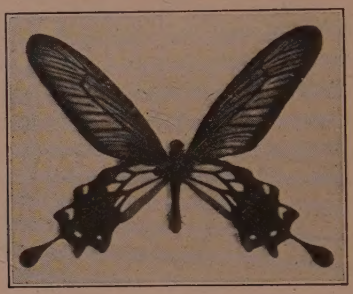

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